

FROMMER LAWRENCE & HAUG LLP

745 FIFTH AVENUE NEW YORK, NEW YORK 10151

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WILLIAM S. FROMMER  
WILLIAM F. LAWRENCE  
EDGAR H. HAUG  
MATTHEW K. RYAN  
BARRY S. WHITE  
THOMAS J. KOWALSKI  
JOHN R. LANE  
DENNIS M. SMID \*  
DANIEL G. BROWN  
BARBARA Z. MORRISSEY  
STEVEN M. AMUNDSON  
MARILYN MATTHES BROGAN  
JAMES K. STRONSKI

A. THOMAS S. SAFFORD  
JEROME ROSENSTOCK  
RAYMOND R. WITTEKIND, PH.D.  
SUSAN K. LEHNHARDT, PH.D.  
Of Counsel

GORDON KESSLER  
MARK W. RUSSELL \*  
BRUNO POLITO  
GRACE L. PAN \*  
JEFFREY A. HOVDEN  
JOE H. SHALLENBURGER  
CHRISTIAN M. SMOLIZZA  
GLENN F. SAVIT  
ROBERT E. COLLETTI  
DEXTER T. CHANG  
PETER J. WAIBEL  
LINDSEY A. MOHLE  
DEENA P. LEVY  
DARRIN M. SIMON  
YUFENG LIU, PH.D.  
CHRISTINE PEPE  
CINDY HUANG

\*Admitted to a Bar  
other than New York

June 13, 2000

Assistant Commissioner for Patents  
Washington, D.C. 20231

Re: U.S. Patent Application  
Applicants: Veselin BRANKOVIC, Dragan KRUPCEZEVIC, Mohamed  
RATNI, Hamid AMIR-ALIKHANI, Kenichi KAWASAKI, Kazuji  
KAWASAKI, Keiji FUKUZAWA  
Our Ref.: 450103-02669

Dear Sir:

Enclosed are papers constituting the above patent application which is being filed under 37 C.F.R. 1.53 without a signed Declaration. Please accord a filing date and a serial number to such application and inform the undersigned thereof so that a signed Declaration and the surcharge required by 37 C.F.R. 1.16(e) may be duly filed.

Please address all correspondence to:

William S. Frommer, Esq.  
FROMMER LAWRENCE & HAUG LLP  
745 Fifth Avenue  
New York, New York 10151

Respectfully,



William S. Frommer  
Reg. No. 25,506  
Attorney for Applicants  
Enclosures

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jc052 U.S. PTO

jc008 U.S. PTO  
09/593178  
06/13/00

Patent Application Transmittal  
(only for new nonprovisional applications under 37 C.F.R. 1.53(b))  
Correspondence Address:  
FROMMER LAWRENCE & HAUG LLP  
745 FIFTH AVENUE  
NEW YORK, NEW YORK 10151  
TEL: (212) 588-0800  
FAX: (212) 588-0500

Date: June 13, 2000  
Attorney Docket No.: 450103-02669

ASSISTANT COMMISSIONER FOR PATENTS  
Box Patent Application  
Washington, D.C. 20231

Sir:

With reference to the filing in the United States Patent and Trademark Office of an application for patent in the name(s) of:

Veselin BRANKOVIC, Dragan KRUPCEZEVIC, Mohamed RATNI, Hamid AMIR-ALIKHANI,  
Kenichi KAWASAKI, Kazuji KAWASAKI, Keiji FUKUZAWA

entitled:

WIRELESS TRANSMISSION SYSTEM

The following are enclosed:

- ☒ Specification ( 11 pages)
- ☒ 6 Sheet(s) of Drawings
- ☒ 33 Claim(s) (including 5 independent claim(s))
- ☐ This application contains a multiple dependent claim

- ☒ Our check for \$ 1080.00, calculated on the basis of the claims as amended by any enclosed preliminary amendment as follows:

Basic Fee, \$690.00 (\$345.00)	\$ 690.00
Number of Claims in excess of 20 at \$18.00 (\$9.00) each: 13	234.00
Number of Independent Claims in excess of 3 at \$78.00 (\$39.00) each: 2	156.00
Multiple Dependent Claim Fee at \$260.00 (\$130.00)	-0-
Total Filing Fee	\$ 1080.00
Assignment Recording Fee \$40.00	-0-

- ☒ Oath or Declaration and Power of Attorney
  - ☒ New ☐ signed ☒ unsigned
  - ☐ Copy from a prior application (37 C.F.R. 1.63(d))

- ☐ Certified copy of each of the following application(s) to substantiate the claim(s) for priority made in the Declaration:

<u>Application No.</u>	<u>Filed</u>	<u>In</u>
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Please charge any additional fees required for the filing of this application or credit any overpayment to Deposit Account No. 50-0320.

Respectfully submitted,

FROMMER LAWRENCE & HAUG LLP  
Attorneys for Applicants

By William S. Frommer  
William S. Frommer  
Reg. No. 25,506

06-14-00

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450103-026



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Date of Deposit June 13, 2000

I hereby certify that this paper or fee, and a patent application and accompanying papers, are being deposited with the United States Postal Service "Express Mail Post Office to Addressee" service under 37 CFR 1.10 on the date indicated above and are addressed to the Assistant Commissioner for Patents, Washington, DC 20231.

Charles Jackson

(Typed or printed name of person mailing paper or fee)

Charles Jackson

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PATENT  
450103-02669

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE  
APPLICATION FOR LETTERS PATENT

SONY International (Europe) GmbH  
 SONY Electronics  
 „Wireless Transmission System“  
 P23978

5

### Wireless Transmission System

- 10 The present invention relates to a wireless transmission system operating in a 60 GHz range which can be used for open public applications.

The data rate demand for wireless systems is permanently growing due to the variety of new applications. To meet the increased demand of high data rate applications, a new  
 15 generation of the wireless communication systems is targeted. Due to the common spectrum shortage, the natural way of looking at higher frequencies like those in higher microwave and lower millimeter-wave bands is recommended. Recently the spectrum in a 60 GHz range (a 59 to 64 GHz band) has been allocated for non-licensed applications worldwide. Other non-licensed bands are for example the 2.4 GHz ISM-  
 20 band, the 5.8 GHz band and the 24 GHz band.

Background information can be found in L. Fernandes, „Developing a System Concept and Technologies for Mobile Broadband Communications“, IEEE Personal Communication Magazine, February 1995.

25

The following European patent applications of Sony International (Europe) GmbH relate to technologies which can be applied for a transmission in said 60 GHz non-licensed frequency band:

- 30 EP 0 969 602 A1 relating to a TX/RX structure for a dual frequency mode,  
 EP 1 006 668 A1 relating also to a dual frequency band transceiver,  
 EP 0 889 543 A1 relating to a wideband printed dipole antenna for microwave and millimeter-wave applications,  
 EP 0 920 074 A1 relating to a circular polarized planar printed antenna concept with  
 35 shaped radiation pattern,  
 EP 0 889 542 A1 relating to a wideband printed phase array antenna for microwave and millimeter-wave applications.

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According to a still further aspect of the present invention a wireless transmission system designed for the transmission of data in the 60 GHz range is provided, the

system comprising at least two mobile terminals respectively provided with a narrow angle antenna for communication with each other.

According to a still further aspect of the invention a wireless transmission system is  
5 proposed comprising a plurality of public access server and at least one mobile  
terminal. The mobile terminal is designed to upload/download content from the public  
access server by means of a wireless transmission and the public download server all  
operate with the same transmission frequency in a non-licensed frequency band.

10 The communication between the mobile terminal and respectively a public access server is preferably free of charge. The uploading/downloading of content can be charged to the user of the mobile terminal.

Preferably there is no hand-over between adjacent public access server.

15 According to a still further aspect of the invention, a method for uploading and/or downloading content from a public access server to/from mobile terminals over an air interface is proposed. The air interface uses a non-licensed frequency band and the transmission itself is free of charge. The user of a mobile terminal is charged for  
20 uploading/downloading content. Preferably a service provider is owner of the public access server.

The public access server can be installed in a large hall environment, in public vehicles, facing sidewalks, and/or at gas stations or traffic lights.

25 Further advantages, features and objects of the present invention will become evident for the man skilled in the art when reading the following detailed description of embodiments taken in conjunction with the figures of the enclosed drawings.

30 Figure 1 shows a 60 GHz public access system application scenario,

Figure 2 shows a 60 GHz public access system application scenario applied for underground and trains,

35 Figure 3 shows a 60 GHz public access system application scenario for large rooms (airport, train station, ...),

Figure 4 shows public download server antenna diagram requirements for open public access applications (streets, etc.),

Figure 5 shows public download server antenna diagram requirements for trains, underground and large room environments, and

5 Figure 6 shows a universal terminal as one embodiment of a mobile terminal according to the present invention.

With reference to figures 1, 2 and 3 different environmental scenarios for the application of the present invention will be explained.

10

Generally the present invention is targeting solutions for urban areas like town environments shown in figure 1. Users having a mobile terminal 1 can communicate by means of a wireless transmission in the 60 GHz range and optionally other ranges below said 60 GHz range with fixed hubs 2. The fixed hubs 2 are public access server.

15 Furthermore, two mobile terminals 1 can communicate with each other in the 60 GHz range for example to perform wireless games.

The communication of a mobile terminal 1 with the fixed hub 2 can be used, for example for a fast downloading of video within a short time period on a storage unit (for example hard disc) within the mobile terminal 1. Alternatively, contents of news information centers can be downloaded or video e-mail can be exchanged with the fixed hub 2.

20 Note that the fixed hubs 2 are respectively linked to an information source such as a broadband data highway 22 (for example a ATM fixed backbone) or a main information server 23 by means of a fixed connection 5 or a wireless transmission 6. Note that the mobile terminals 1 are respectively provided with an antenna means 3 with a narrow shaped beam. The fixed hubs 2 are respectively provided with an antenna 4 having a wide angle beam shape. The communication range between respectively a fixed hub 2 and a mobile terminal 1 or between two mobile terminals 1 is for example about 20 meters maximum.

25 Figure 2 shows the application of a wireless transmission system according to the present invention in public transportation means such as underground or trains. On the ceiling 16 of a wagon 17 fixed hubs 2 are provided. These hubs are respectively connected by means of a connection line 5 to a central data server 7. Users within the wagon 17 having a mobile terminal 1 can communicate with the fixed hubs 2 while commuting in the wagon 17. Furthermore a gateway 8 having an interface function is



provided which is connected to the central data server 7 of the wagon 17 and which serves for updating the content of the central data server 7.

Figure 3 shows the application of the present invention in public indoor environment such as airports, railway stations, department and convenient stores. Generally this application relates to the wireless communication within a large hall 19. Again, a fixed hub 2 connected to an information source by means of a connection line 5 is provided on the ceiling 16 of the hall 19. The user can communicate with the fixed hub 2 by means of the antenna 3 of the mobile terminal 1 of the user.

The fixed hubs 2 being fixed axis stations for the communication are preferably public download servers (PDS). The mobile terminals will be distinguished in so-called universal terminals (UT) and terminal with the reduced functionality (TRF).

The fixed hubs and preferably the PDS units can be connected to a information source by different means:

According to a first alternative the PDS units are connected by means of a fixed connection 5 (for example a optical cable) to a broadband data highway 22 (for example an ATM fixed backbone) or a main information server 23 containing the source of information.

According to a second alternative the PDS unit is connected by means of a point-to-point fixed wireless connection 6 to a broadband data highway 22 or a main information server 23 containing the source of information.

According to a still further alternative the PDS unit is connected by a point-to-multi-point wireless local loop (WLL) connection to the broadband data highway 22 or a main information server 23 containing the source of information.

The fixed hub or PDS unit 2 contains a memory block (reference 20 in figure 1) which may be updated by placing a new (updated) memory block in the PDS unit by a service provider. This can be done for example by placing a memory stick with a large memory.

With reference to figures 4 and 5 the wide angle radiation beam of the antennas 4 of the fixed hubs 2 will be explained. The mobile terminals 1 generally have a narrow angle beam shape.

The radiation beams of the antennas 4 of the fixed hubs 2 generally have linear or circular polarization.

Figure 4 shows PDS antenna diagram requirements for street applications. For this scenario the radiation beam of the fixed hubs (PDS) 2 can be like alternatively shown in figures 4a and 4b in a top view, wherein the uniform coverage provided by the alternative according to figure 4b is preferred. The radiation beam according to the embodiment of figure 4b can be described as having a kidney like cross section when seen from above. Besides a uniform coverage this solution offers an extension of the communication range. Therefore, when using the alternative as shown in figure 4b for a larger communication distance the antenna gain is larger and for a smaller communication distance the antenna gain is smaller. This allows an optimization of the transmission power and therefore a reduction of the requirements on the AGC (automatic gain control) of the receiver in the mobile terminal 1.

Figure 5 shows PDS antenna diagram requirements for train, underground and/or large hall environments in which the public download server (PDS) is preferably placed on the ceiling. Preferably the radiation pattern having a top view according to figure 4b is preferred, as it offers uniform coverage solution and an extension of the communication range.

The data rate for the communication of the PDS units with their information source (data highway or main server) may be smaller compared to the communication rate between the fixed hubs (PDS) and the mobile terminals or between two mobile terminals. Optionally the PDS unit can be only a video server or it is connected to a main video server and provides only content coming from the main video server.

With reference to figure 6 a mobile terminal 1 according to the present invention will be explained. The mobile terminals 1 respectively have an antenna 3 providing a "pencil" like beam shape (high gain antenna) with linear or circular polarization.

The mobile terminal 1 can be provided with a camera 9, an optional front end for other wireless systems (for example bluetooth 21), a screen 10 capable of DV playback, a microphone 11, headphone sockets 12, a connection plug 13 for game joysticks, a touch screen 14 and a memory 15 able to store more than one full-time high-quality video.

The antenna 3 can be integrated in a front end consisting of the highway antenna 3 and a RF front end.

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Additional integrated (or output to external) wireless connection radio front ends can be provided having an operation frequency lower than 60 GHz, whereby the operation frequency is not an intermediate frequency of the 60 GHz front end.

- 5 Figure 6 shows a mobile terminal 1 with maximum functionality. Furthermore, a terminal with reduced functionality (TRF) can be used. A TRF has only content decoder, control units and man/machine interfaces as for example a portable MP3 player or a portable DVD player. As a further alternative the TRF may only have a control unit and a man/machine interface as for example a simple display or an  
10 earphone.

- The communication data rate between a PDS unit and a mobile terminal and between two mobile terminals, respectively, exceeds 50 Mbit/s (user data rate) and is preferably larger than 100 Mbit/s. In an ideal case the communication data rate is  $n \cdot 100$  Mbit/s,  
15 whereby  $n$  is an integer larger than 1. Lower data rate modes can also be provided especially in conjunction with the terminal with reduced functionality.

- Both TDMA and FTMA access is allowed. The modulation schemes can be chosen arbitrarily as long as they can cope with very high data rates. The modulation scheme  
20 can be for example OFDM based and optionally the bandwidth is a multiple of the 20 MHz OFDM bandwidth.

- All fixed hubs and mobile terminals are optionally designed to have an intermediate frequency in the 5 GHz range (non-licensed and ISM industrial scientific medical band)  
25 to provide a dual frequency operation in the 5 GHz and 60 GHz range.

- Optionally all fixed hubs and mobile terminals are designed to have an intermediate frequency in the 2,4 GHz range (ISM band) to provide a dual frequency operation in the 2,4 GHz and 60 GHz range.  
30

### Networking and Protocols

- Communication protocol requirements between PDS and UT (or TRF), or between UT (or TRF) and other UT (or TRF):  
35
- has LESS complexity compared to classic WLAN protocols, or classic Cellular system protocols,
  - it may allowed only simple download in restricted operation scenario,
  - they do not necessarily support handover,

- they are not necessarily the same as communication protocols between the PDS unit and data highway or main data server, and by the rule they have less complexity,
- PDS unit may have a means to terminate more complex communication protocol between PDS and data highway and communicate with UT (or TRF) by the simpler protocol definition,
- Optionally, protocol between PDS and UT (or TRF) supports MPEG streaming all more than one MPEG standard,
- Optionally protocol stack between PDS and UT (or TRF) supports IP.

## 10 Advantages of the proposed System compared toknown Systems

### 1. Advantages of the proposed public systems are:

- usage of the non-licensed band in 59-64 GHz range offering, a large spectrum and very large data rates, they are not available to provide to the users,
- due to the non-licensed band, there is no need to pay operation licenses locally, so that everyone may be operator, and cover those areas, which are for operate consider as profitable, mainly only common standard,
- due to very large data rates available a new prospective of applications are opened which are fully complementary to so-called 3G and 4G mobile communication systems, so proposed systems may be considered as a new business opportunity, also for those companies making 2G, 3G and in future 4G business.
- Due to the large frequency of the operation the total front end size and antenna size may be very small and very easy to be integrated in various types of terminals: beginning from current PDA types of terminals, through so-called 2G and 3G to the future UT (or TRF) terminal,
- Due to the large frequency and large attenuation, small transmission power, and specified UT antenna pattern, as well as large oxygen absorption frequency RE-USE may be easily adopted, so there is almost unlimited possibility of providing very large wireless data rates in very small environments. Density and Capacity of the system is almost unlimited, in contrast to so-called 3G and future 4G systems.

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- Proposed concept does not need to have smart backbone infrastructure like cellular systems, it is much more simpler, there is no handover between different fixed hubs and the same transmission frequency can be reused efficiently,
- 5    - Proposed concept has much lower complexity compared to the WLAN (wireless local area network) approach.

#### **Potential Applications**

- 10    The basic business related ideas are:
- a) wireless communication access is free of charge,
  - b) payment only for specific content (e.g. video, audio, newspapers, game downloading, gaming),
- 15    c) the key operation mode is downloading,
- d) sending and receiving private information (E-mails, video E-mails, documents, profiles) is in principle free of charge,
  - e) gaming from one UT to another UT, as well as gaming from UT with PDS is free of charge,
- 20    f) Some charges may be applied for real time, delay sensitive, applications like video and audio telephony,

#### ***Application Examples:***

- 25    a) User downloads a high quality video content from PDS within couple of minutes (data rates larger than 100 Mbit/s). The data is memorized on the memory entity (e.g. miniature hard disc or future memory stick), which is placed within the UT terminal. After that the user may playback the content where he wants, and in time he wants, independently from further wireless access availability. The payment of
- 30    the content goes by personal identification process via scrambled information sent by UT to PSD.
- b) A user passes near the PSD and pickup in walking by pressing the button at UT, within the seconds wanted newspaper or magazine, and read it where he wants, and
- 35    when he wants, independently from further wireless access availability. The payment of the content goes by personal identification process via scrambled information sent by UT to PSD.



- k) During a visit to the general store or airport (large indoor environment with public access) user takes content from 60 GHz PDS unit. Large store and for example airport are offering free of charge navigation service for their environments and entertainment program. Content provided for user may be also free of charge, but aligned with commercials, coming from owner of the PSD unit.
- l) By giving to user free of charge UT or TRF, to obtain only selected (limited by provider of the free terminal) content,
- m) While buying some snacks in small 24-hours convenience store, user picks up some information / entertainment content (using 60 GHz means) from in-door PDS unit to his UT or TRF.

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**Claims:**

1. Wireless transmission system designed for the transmission of data in the 60 GHz range,
- 10 the system comprising:
- a public download server connected to an information source, and
  - a mobile terminal provided with a narrow beam antenna.
2. System according to claim 1,
- 15 characterized in that the communication range is 20 meters or less.
3. System according to claim 1, characterized in that
- 20 the public download server is connected to a broadband data highway or a main server by means of an optical cable.
4. System according to claim 1, characterized in that
- 25 the public download server is connected to a broadband data highway or a main server by means of a wireless point-to-point connection.
5. System according to claim 1, characterized in that
- 30 the public download server is connected to a broadband data highway or a main server by means of a point-to-multipoint wireless local loop connection.
6. System according to claim 1, characterized in that
- 35 the public download server and the mobile terminal are designed for a dual frequency operation, one transmission frequency being the 60 GHz range and a second transmission frequency being an intermediate frequency below the 60 GHz range.
7. System according to claim 1,



characterized in that  
the public domain server is provided with a wide angle beam antenna.

8. System according to claim 1,  
5 characterized in that  
the public domain server is provided with an antenna with a kidney shaped beam in cross-section.
9. System according to claim 1,  
10 characterized in that  
the public domain server and the mobile terminal are designed exclusively for uploading/downloading content from the public domain server to the mobile terminal.
10. Wireless transmission system designed for the transmission of data in the 60 GHz  
15 range,  
the system comprising:  
- a fixed hub provided with a wide angle beam antenna, and  
- a mobile terminal provided with a narrow beam antenna.
- 20 11. System according to claim 10,  
characterized in that  
the communication range is 20 meters or less.
12. System according to claim 10,  
25 characterized in that  
the fixed hub is connected to a broadband data highway or a main server by means of an optical cable.
13. System according to claim 10,  
30 characterized in that  
the fixed hub is connected to a broadband data highway or a main server by means of a wireless point-to-point connection.
14. System according to claim 10,  
35 characterized in that  
the fixed hub is connected to a broadband data highway or a main server by means of a multipoint wireless local loop connection.
15. System according to claim 10,

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the fixed hub and the mobile terminal are designed for a dual frequency operation, one transmission frequency being the 60 GHz range and a second transmission frequency being an intermediate frequency below the 60 GHz range.

16. System according to claim 10,  
characterized in that  
the fixed hub is provided with an antenna with a kidney shaped beam in cross-section.

15 18. Wireless transmission system designed for the transmission of data in the 60 GHz range,  
the system comprising at least two mobile terminals respectively provided with a narrow angle antenna for communication with each other.

20. System according to claim 18,  
25 characterized in that  
the mobile terminals are respectively provided with game software to enable the users to  
play games with each other by means of the mobile terminals.

35 22. Wireless transmission system,  
comprising a plurality of public access server and at least one mobile terminal,  
wherein the mobile terminal is designed to upload/download content from the public  
access server by means of a wireless transmission and the public download server all  
operate with the same transmission frequency in a non-licensed frequency band.



32. Method according to claim 26,  
characterized in that  
the public access server is installed facing sidewalks.

- 5 33. Method according to claim 26,  
characterized in that  
the public access server is installed at gas stations or traffic lights.

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## 10

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(Figure 1)

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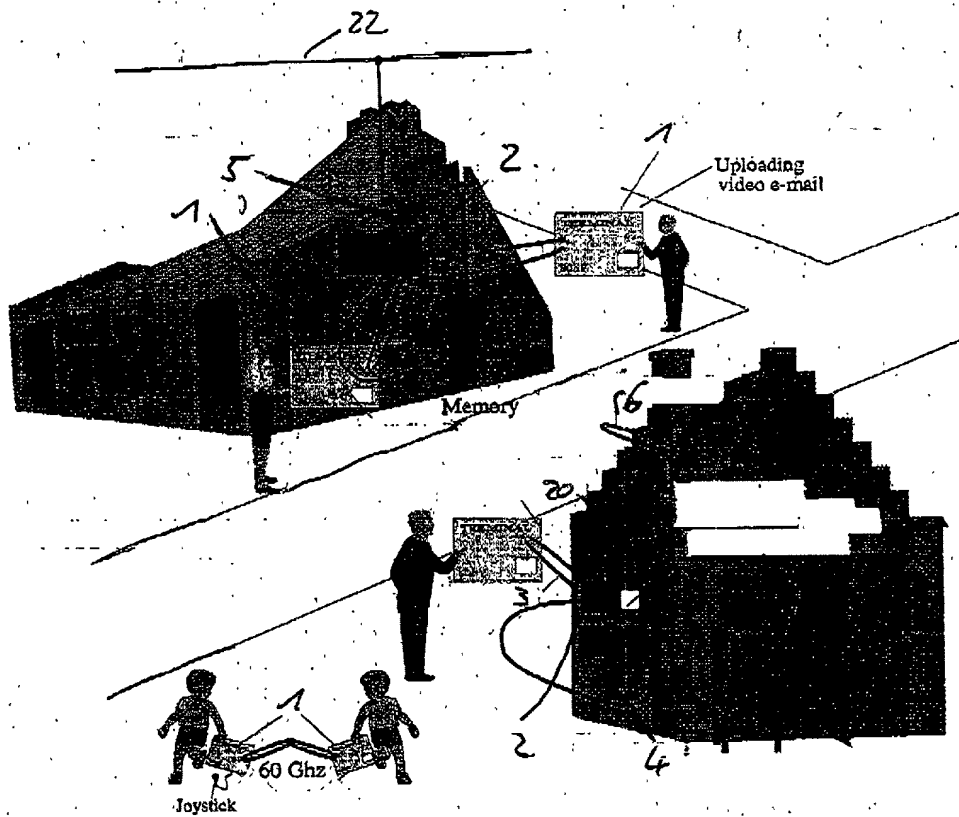


Fig. 1

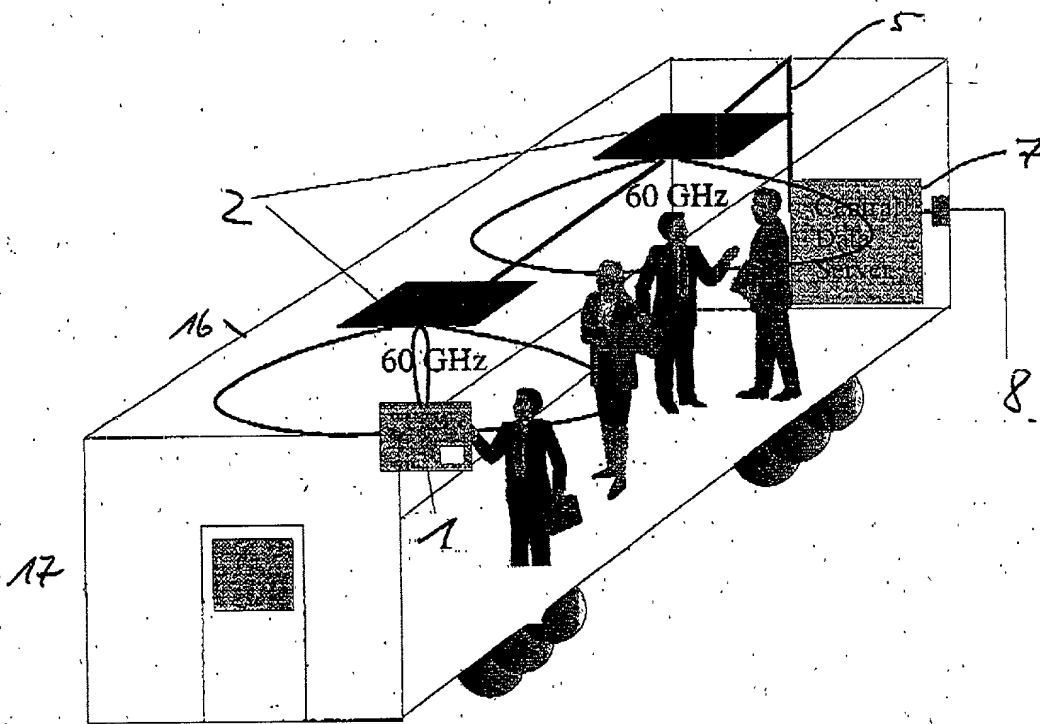


Fig. 2

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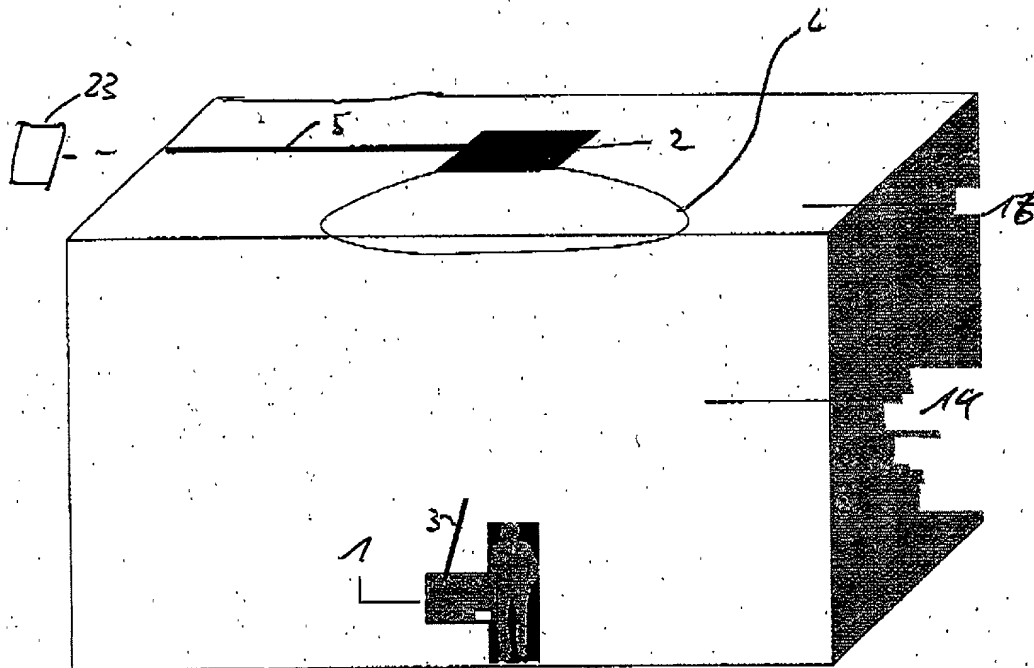


Fig. 3



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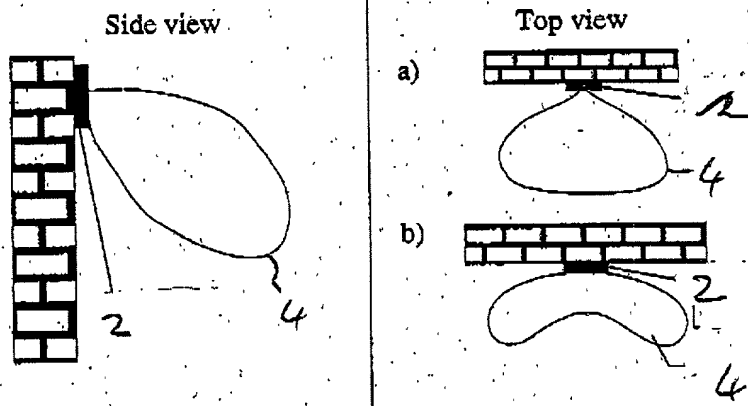


Fig. 4

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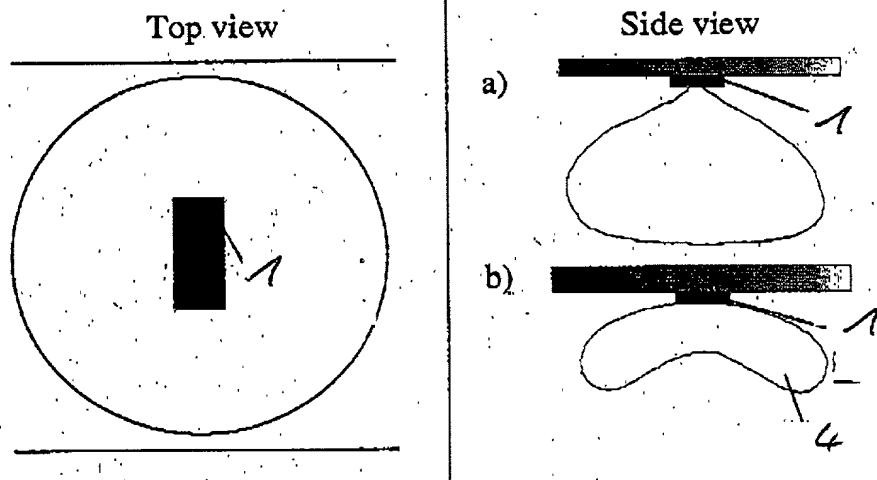
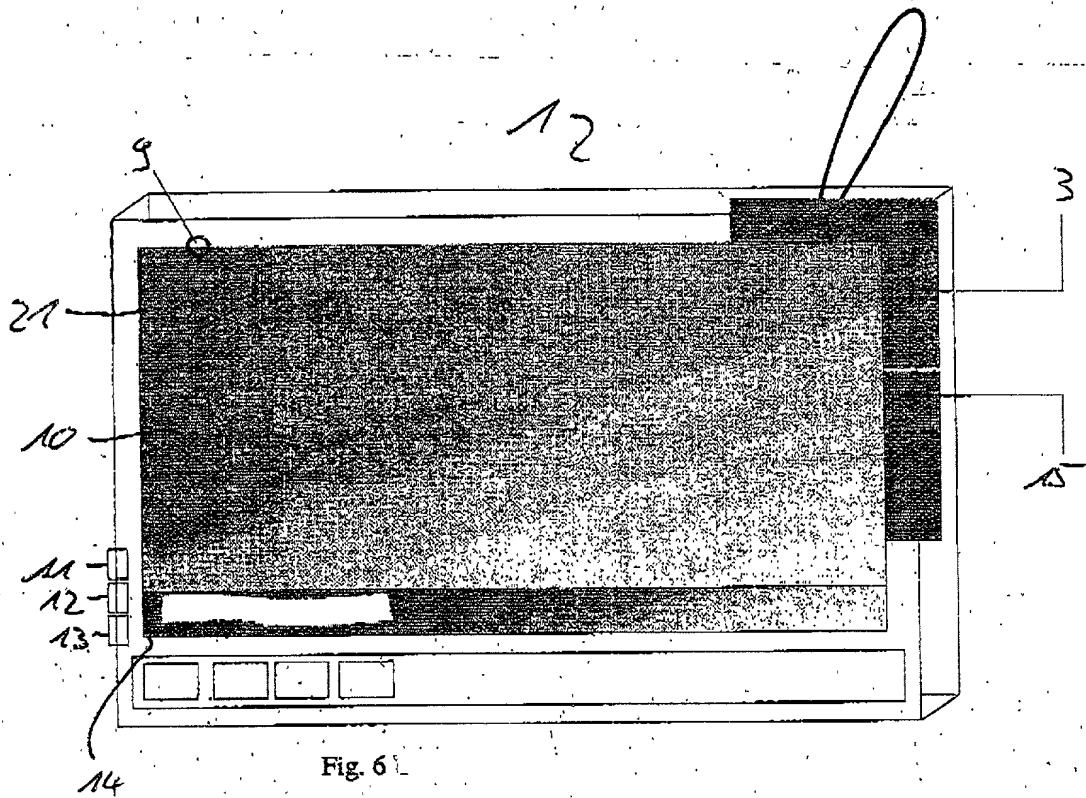


Fig. 5

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**DECLARATION FOR PATENT APPLICATION (JOINT OR SOLE)**

**(Under 37 CFR § 1.63; with Power of Attorney)**

**FROMMER LAWRENCE & HAUG LLP**

FLH File No. 450103-02669

As a below named inventor, I hereby declare that:  
My residence, post office address and citizenship are as stated below next to my name,  
I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention ENTITLED:

**WIRELESS TRANSMISSION SYSTEM**

the specification of which

  X   is attached hereto.

           was filed on                      as Application Serial No.                     ,

with amendment(s) through                      (if applicable, give dates).

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose to the United States Patent and Trademark Office all information known to me to be material to patentability as defined in Title 37, Code of Federal Regulations, Sec. 1.56.

I hereby claim foreign priority benefits under Title 35, United States Code, § 119 of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

<u>Prior Foreign Application(s)</u> [list additional applications on separate page]:	<u>Priority Claimed:</u>
<u>Number:</u>	<u>Country:</u>
<u>Filed (Day/Month/Year):</u>	<u>Yes</u> <u>No</u>

I hereby claim the benefit under Title 35, United States Code, § 120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code § 112, I acknowledge the duty to disclose to the United States Patent and Trademark Office all information known to me to be material to patentability as defined in Title 37, Code of Federal Regulations, Sec. 1.56, which became available between the filing date of the prior application and the national or PCT international filing date of this application:

<u>Prior U.S. Application(s)</u> [list additional applications on separate page]:
<u>App'n. Ser. Number:</u> <u>Filed (Day/Month/Year):</u> <u>Status (patented, pending, abandoned):</u>

I hereby appoint WILLIAM S. FROMMER, Registration No. 25,506, and DENNIS M. SMID, Registration No. 34,930 or their duly appointed associate, my attorneys, with full power of substitution and revocation, to prosecute this application, to make alterations and amendments therein, to file continuation and divisional applications thereof, to receive the Patent, and to transact all business in the Patent and Trademark Office and in the Courts in connection therewith, and specify that all communications about the application are to be directed to the following correspondence address:

WILLIAM S. FROMMER, Esq.  
c/o FROMMER LAWRENCE & HAUG LLP  
745 Fifth Avenue  
New York, New York 10151

Direct all telephone calls to:  
(212) 588-0800  
to the attention of:  
WILLIAM S. FROMMER

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

INVENTOR(S):

Signature: \_\_\_\_\_ Date: \_\_\_\_\_

Full name of sole or first inventor: Veselin BRANKOVIC  
Residence: Stuttgart, Germany  
Citizenship: Yugoslavia  
P.O. Address: c/o Advanced Technology Center Stuttgart  
Sony International (Europe) GmbH  
Hedelfinger Strasse 61  
70327 Stuttgart, Germany

Signature: \_\_\_\_\_ Date: \_\_\_\_\_

Full name of 2nd joint inventor (if any): Dragan KRUPCEVIC  
Residence: Stuttgart, Germany  
Citizenship: Yugoslavia  
P.O. Address: c/o Advanced Technology Center Stuttgart  
Sony International (Europe) GmbH  
Hedelfinger Strasse 61  
70327 Stuttgart, Germany

[Similarly list additional inventors on separate page]

Post Office Address(es) of inventor(s):

[if all inventors have the same post office address]

Note: In order to qualify for reduced fees available to Small Entities, each inventor and any other individual or entity having rights to the invention must also sign an appropriate separate "Verified Statement (Declaration) Claiming [or Supporting a Claim by Another for] Small Entity Status" form [e.g. for Independent Inventor, Small Business Concern, Nonprofit Organization, individual Non-Inventor].

Note: A post office address must be provided for each inventor.

## ADDITIONAL INVENTORS

Signature: \_\_\_\_\_ Date: \_\_\_\_\_  
Full name of 3rd joint inventor (if any): Mohamed RATNI  
Residence: Stuttgart, Germany  
Citizenship:  
P.O. Address: c/o Advanced Technology Center Stuttgart  
Sony International (Europe) GmbH  
Hedelfinger Strasse 61  
70327 Stuttgart, Germany

Signature: \_\_\_\_\_ Date: \_\_\_\_\_  
Full name of 4th joint inventor (if any): Hamid AMIR-ALIKHANI  
Residence: Stuttgart, Germany  
Citizenship:  
P.O. Address: c/o Advanced Technology Center Stuttgart  
Sony International (Europe) GmbH  
Hedelfinger Strasse 61  
70327 Stuttgart, Germany

Signature: \_\_\_\_\_ Date: \_\_\_\_\_  
Full name of 5th joint inventor (if any): Kenichi KAWASAKI  
Residence: California, USA  
Citizenship:  
P.O. Address: c/o Advanced Technology Center  
Sony Electronics Inc.  
16450 West Bernardo Dr, MZ 7205  
San Diego, CA 92126  
USA

Signature: \_\_\_\_\_ Date: \_\_\_\_\_  
Full name of 6th joint inventor (if any): Kazuji KAWASAKI  
Residence: Tokyo, Japan  
Citizenship: Japan  
P.O. Address: c/o Sony Corporation  
RF Systems Lab, Home Network Company  
6-7-35 Kitashinagawa  
Shinagawa-Ku, Tokyo 141-0001  
Japan

Signature: \_\_\_\_\_ Date: \_\_\_\_\_  
Full name of 7th joint inventor (if any): Keiji FUKUZAWA  
Residence: Tokyo, Japan  
Citizenship: Japan  
P.O. Address: Sony Corporation  
RF Systems Lab, Home Network Company  
6-7-35 Kitashinagawa  
Shinagawa-Ku, Tokyo 141-0001  
Japan